22438

23124

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE of the following : 10

(a) Define higher pair with one example.

(b) List any four inversions of single slider crank chain mechanism.

(c) Define (i) angular velocity (ii) angular acceleration

(d) List any four types of followers.

(e) Define : (i) Prime Circle (ii) Cam Profile

(f) Enlist any four types of brakes.

(g) State the function of a flywheel.

2. Attempt any THREE of the following : 12

(a) Explain with neat sketch any two types of constrained motions.

(b) Differentiate between belt drive and chain drive (any four points).

(c) Explain with neat sketch any two types of follower motions.

(d) Explain the construction of compound gear train using suitable sketch.

3. Attempt any THREE of the following : 12

(a) Explain with neat sketch working of beam engine.

(b) Draw a neat sketch of crank and slotted lever quick return motion mechanism and label the details.

(c) Explain with neat sketch principle of working of single plate clutch.

(d) Distinguish between cam and follower.

(e) Explain with neat sketch turning moment diagram of a flywheel for single cylinder 4 stroke I.C. engine.

4. Attempt any TWO of the following : 12

(a) Draw a neat sketch of elliptical trammel & write down stepwise procedure to draw an ellipse with the help of elliptical trammel.

(b) The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. Determine linear velocity and acceleration of the midpoint of the connecting rod at a crank angle of 45° from inner dead centre position. Use graphical method.

(c) A cam is to be designed for a knife edge follower with the following data :

Minimum radius of cam = 50 mm

Stroke of the follower = 30 mm

Outstroke 90° with uniform velocity.

Dwell for next 60° of cam rotation.

Follower returns to original position during 90° of cam rotation with uniform velocity. The axis of follower passes along with axis of cam & cam rotates in clockwise direction. Dwell for remaining 120° of cam rotation. Draw profile of a cam.

5. Attempt any TWO of the following : 12

(a) In a flat belt, initial tension is 1800 N, angle of lap on smaller pulley is 170°, co-efficient of friction is 0.25. The diameter of pulley is 90 cm. It runs at 540 rpm.

Find : Increase in power transmitted if initial tension is increased by 10%.

(b) In a slider crank mechanism, crank is 200 mm long and connecting rod length is 700 mm. The angular velocity of crank is 25 radians per second. Find the velocity of piston and angular velocity of connecting rod, when crank has turned through 45° from IDC in clockwise direction. Use Klein's construction method.

(c) Draw a neat sketch of centrifugal governor and write stepwise procedure to control fuel supply to engine with the help of centrifugal governor.

6. Attempt any TWO of the following : 12

(a) A pulley is driven by a flat belt, the angle of lap being 120°. The belt is 100 mm wide by 6 mm thick and density 1000 kg/m^3. If the co-efficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2 MPa, find the greatest power which the belt can transmit and the corresponding speed of the belt.

(b) Draw neat labelled sketch of Internal expanding shoe brake and explain its working principle.

(c) Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radius of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required if its radius of rotation is 0.2 m.
